‘Growing your own’: a multi-level modelling approach to understanding personal food growing trends and motivations in Europe

Article (Published Version)

Ecological Economics 110 (2015) 71–80

Contents lists available at ScienceDirect

Ecological Economics

journal homepage: www.elsevier.com/locate/ecolecon

Analysis

'Growing your own': A multi-level modelling approach to understanding personal food growing trends and motivations in Europe

A. Church [a,*], R. Mitchell [b], N. Ravenscroft [a], L.M. Stapleton [c]

[a] School of Environment and Technology, Faculty of Science and Engineering, University of Brighton, BN2 4GJ, United Kingdom
[b] Institute of Health and Well Being, University of Glasgow, G12 8QQ, United Kingdom
[c] SPRU (Science Policy Research Unit), School of Business, Management & Economics, University of Sussex, BN1 9SL, United Kingdom

ARTICLE INFO

Article history:
Received 17 February 2014
Received in revised form 1 December 2014
Accepted 18 December 2014
Available online xxxx

Keywords:
Gentrification
Happiness
Independence
Sufficiency

ABSTRACT

Growing food for personal and family consumption is a significant global activity, but one that has received insufficient academic attention, particularly in developed countries. This paper uses data from the European Quality of Life Survey (EQLS) to address three areas of particular concern: the prevalence of growing your own food and how this has changed over time; the individual and household context in which growing takes place; and whether those who grow their own food are happier than those who do not. Results showed that there was a marked increase in growing your own food in Europe, in the period 2003–2007. This increase is largely associated with poorer households and thus, possibly, economic hardship. In the UK however the increase in growing your own food is predominantly associated with older middle class households. Across Europe, whether causal or not, those who grew their own were happier than those who did not. The paper therefore concludes that claims about the gentrification of growing your own may be premature. Despite contrary evidence from the UK, the dominant motive across Europe appears to be primarily economic — to reduce household expenditure whilst ensuring a supply of fresh food.

1. Introduction

Much has been written about the political nature of food security and food growing for personal consumption in developing nations (Altieri and Toledo, 2011; Premat, 2009; Yu and You, 2013). In contrast, until recently relatively little attention has been paid to growing food for personal consumption in domestic or communal spaces in developed countries (Corrigan, 2011). Yet, just as in developing countries, writers and activists have argued that people growing their own food can play an important role in resisting the power of globalised agribusiness and promoting a more socially just and ecologically sustainable world (Nabhan, 2002; McKay, 2011; Ray, 2012; Ravenscroft et al., 2012, 2013). This approach to integrating food growing into urban societies is part of a new food geography that addresses increasing demand for fresh food through sustainable food production, whilst also enhancing food security and sovereignty (Mees and Stone, 2012; Morgan et al., 2006; Wiskerke, 2009; Wiskerke and Viljoen, 2012). It may also promote the health and wellbeing of those involved (Clavin, 2011; Kortright and Wakefield, 2011), particularly if they are elderly or socially vulnerable (Fieldhouse, 2003; Milligan et al., 2004; Sempick et al., 2004, 2005; van den Berg et al., 2010; Wang and MacMillan, 2013).

Despite this increasing interest, there is little published material on the scale and significance of personal food growing in developed countries (see Byrne, 2013, for a review of published studies on community gardens). There is only a limited literature describing how many people are growing their own food in different countries and their socio-economic and demographic characteristics (Draper and Freedman, 2010). There is even less material about how the numbers and types of people growing their own food are changing over time. This paper seeks to address these information gaps by examining the prevalence of growing you own food across Europe, and the characteristics associated with it. It will do so through an analysis of survey data from the 2003 and 2007 waves of the European Quality of Life Survey (EQLS). This survey was conducted across 15 European Union countries and included items on domestic and community food growing, as well as capturing respondents' socio-economic and demographic characteristics.

1.1. The significance to participants of growing food

The health and wellbeing benefits of food growing can be categorised into: (a) those associated with the *activity* of food growing; (b) those associated with the *output* from the activity; and (c) *externality benefits* that are not directly related to either the activity or the output. In terms of the activity, growing food involves physical exercise which confers health benefits on most people (Wakefield et al., 2007); particularly the

* Corresponding author at: Centre for Research and Development, Social Sciences, University of Brighton, BN1 9PH, United Kingdom.
E-mail address: a.church@brighton.ac.uk (A. Church).

http://dx.doi.org/10.1016/j.ecolecon.2014.12.002
0921-8009/

elderly (van den Berg et al., 2010; Wang and MacMillan, 2013). The contribution of food growing to the personal independence of older or vulnerable people has also been noted (Fieldhouse, 2003; Milligan et al., 2004; Sempick et al., 2004, 2005) and Crouch and Ward (1999) argued that food growing on allotments had a wide variety of individual and communal benefits including self-fulfilment, identity affirmation, self help and mutual support. In terms of the produce which is the output of food growing, food safety (National Gardening Association, 2009) and better tasting, higher quality food (Kortright and Wakefield, 2011; National Gardening Association, 2009; Wakefield et al., 2007) may be important in terms of the health benefits that they confer (Wakefield et al., 2007; van den Berg et al., 2010).

Finally, there are a number of benefits that may be derived from the practice of growing food. These include better eating habits (Litt et al., 2011), the satisfaction of growing, eating and sharing self-grown food (Tomkins, 2014), and providing people with space to be alone (Clavin, 2011), or to be with others (Clavin, 2011; Kortright and Wakefield, 2011; Middling et al., 2011; National Gardening Association, 2009), and to spend time outdoors (Kingsley et al., 2009; National Gardening Association, 2009). Such benefits may vary socially and by ethnicity with a number of qualitative studies finding that lower income groups (Pudup, 2008) and people from ethnic minorities (Shinew et al., 2004) value food growing sites for the opportunity to build social interaction and community cohesion. Furthermore, qualitative research indicates that the techniques used to grow food vary by ethnicity allowing growers from particular ethic groups to feel engaged with distinct cultural traditions (Buckingham, 2005). There is also the potential for education and skill development through the activity of food growing (Clavin, 2011; Kortright and Wakefield, 2011) and some qualitative or small sample studies argue that skill development linked to food growing can be most pronounced amongst children (Kortright and Wakefield, 2011; National Gardening Association, 2009) and older or vulnerable people (Duchemin et al., 2008; Fieldhouse, 2003; Sempick et al., 2004, 2005). Similar to the health and wellbeing conferred by food growing, these benefits need not directly impinge on the activity or what it produces; it can provide a medium for teaching and learning about the natural world beyond the food being grown for personal consumption (Kortright and Wakefield, 2011).

The forgoing benefits are centred on people but the potential for food growing to ameliorate environmental impacts also emerges in a number of studies (see, for example, Okvat and Zautra, 2011). The benefit of environmental sustainability is noted by Kortright and Wakefield (2011) who identified gardeners who "grew food primarily to reduce their ecological footprint" (p. 45). Living 'locally' and upholding traditional production methods (National Gardening Association, 2009) are also benefits with an environmental dimension. Research into organic food purchasing indicates how choices around food and how it is grown are also influenced by environmental values and attitudes (Aertsens et al., 2009).

There is also an economic dimension to growing food, with over half of the National Gardening Association's (2009) respondents listing this as a significant reason to grow food. Indeed, it was the second most popular reason for growing their own, after wanting better tasting food. In their smaller scale study, Wakefield et al noted how:

> Most participants spoke of improved food access and cost-saving in some way. In some cases, substituting garden-grown produce for store-bought foods was seen to make a significant difference in household food costs.
>
> [Wakefield et al., 2007, p. 97]

In addition to saving money, the economic benefits of food growing have sometimes been framed in terms of food security (e.g. Duchemin et al., 2008). In their review of the literature on community gardens, Guitart et al. (2012) note a discrepancy between observations about saving money, which are numerous, and explicit quantification of how much money is saved. This discrepancy, interesting in its own terms, becomes more important when considered in the context of the long-time reliance placed on these spaces by some people to provide food in times of economic crisis (Pudup, 2008).

Although rarely reflected upon in the literature it is of course possible that there are costs/disadvantages associated with growing your own food. In the context of allotments, Crouch (2003, p. 3) notes how "[t]hey can be haunting, uncomfortable places too: negative and unsettling". Whilst in the context of community gardening, Okvat and Zautra (2011) reflect on the formation of in-groups leading to the exclusion of certain people. Methodologies for the collection of primary data about the benefits of food growing could, in future, pay more attention to the consideration and thus documentation of costs / disadvantages in order that a more complete story is told. Indeed, this could serve the purposes of food growing proponents if explicit and transparent consideration of negativities concludes that they are both minor and uncommonly experienced.

1.2. The scale of personal food growing

Whilst claims about the benefits of 'growing your own' abound, there is less information about the scale of food growing activity, although assertions have been made recently that there has been a significant increase in numbers of people growing their own food in countries such as the UK and the USA (Ray, 2012; Horticultural Trade Association, 2010). These were supported an American study suggesting that 31% of households surveyed identified themselves as people who grew their own food (The National Gardening Association, 2009). The National Gardening Association (2009) suggested that this was likely to rise considerably, with a further 6% of respondents reporting that they planned to grow some of their own food in the coming year. Although there were no sizeable gender differences, nor any clear income patterns, the food growers in this study tended to be well educated and married without children. Unfortunately, similar data were not presented for the respondents who did not grow their own food, meaning that no comparisons can be undertaken.

Three overarching reports describe the European Quality of Life Survey (EQLS), with Alber et al. (2004) reporting the first wave of data collected in 2003, and Anderson et al. (2009, 2012) reporting the second wave (2007) and third wave (2012). Only the first and second waves included questions on food growing. The two relevant studies (Alber et al., 2004; Anderson et al., 2009) illustrated a number of differences in food growing, for four different country groups,[1] in terms of the income quartile of respondents and urban versus rural dwellers. Across all country groups, both analyses illustrated an inverse relationship between income and food growing. People in rural areas were also more likely to grow their own food compared to their urban counterparts. Large differences in food growing patterns were also observed between country groups. For example, candidate countries and, particularly, new member states had higher proportions (usually above 25%) of their populations involved in this activity compared to EU15 and EU25/27 countries, where between 5% and 20% of the population were usually involved in food growing.[2] This suggests that there is geography to personal food growing at the European scale which needs to be understood more fully. However, there is no discussion in

[1] In Alber et al. (2004) EU15, EU25, NMS10 (10 new member states which joined the EU in 2004) and CC3 (candidate countries Bulgaria, Romania and Turkey). In Anderson et al. (2009) EU15, EU27, NMS12 (12 new member states, 10 of which joined the EU in May 2004, plus Bulgaria and Romania which joined in 2007) and CC3 (candidate countries Croatia, Former Yugoslav Republic of Macedonia and Turkey).

[2] Broadly, the (reported) higher prevalence of food growing in America compared to most countries in Europe could be a function of relative-to-income land and house prices which affect whether people have/can afford outdoor food growing space (Davies, 2009; The Economist, 2014).

Anderson et al. (2009) about whether and how food growing patterns have changed since Alber et al.'s (2004) analysis of the first EQLS.

Some studies have sought to chart changes in personal food growing through examining changes in food growing spaces, although there is uneven information in this regard. People grow, or could grow, their own food for personal consumption in many and diverse settings such as allotments, balconies, community gardens, fire escapes, indoor surfaces, pots on patios, private gardens, rooftops and school gardens (Grewal and Grewal, 2012; Kortright and Wakefield, 2011; Vogel, 2008). In the UK it is estimated that 87% of households have access to a private garden (Davies et al., 2009), although individual gardens are becoming smaller (MINTEL, 2005) and there has been a tendency to pave over front garden plots, reducing actual or potential food growing space (Freeman et al., 2012). The decline in the proportion of garden owners who grow vegetables, from 35% in 1986 to 20% in 1996 (MINTEL, 1997) may be associated with this reduction in available growing space. However, a Canadian study based on semi-structured interviews with people who grow their own food (Kortright and Wakefield, 2011, p. 50) noted that "more garden space does not necessarily lead to more food growing […] some of the largest supported the smallest amounts of food". Rather than access to growing space, therefore, the authors concluded that the principal barriers to food growing were having the necessary skills and time to garden.

Although far less substantial than private gardens in number and area, allotment gardens are also significant, numbering around three million in Europe (Barthel et al., 2010). Reductions in both the number and extent of allotments over time have been noted in Dutch and UK contexts (Statistics Netherlands, 2009; Church et al., 2011) although there are signs that this long-term decline may be stabilising, if not reversing, at least in the UK where "many areas […] have witnessed an increase in allotment waiting lists, and new allotments have opened in many parts" (Church et al., 2011: p. 649). There is currently relatively high demand for allotments in the UK, with around 30 applicants on average for each of the nation's 206,000 available plots (Jones, 2009). There is also evidence to suggest that demand for community gardens may be increasing in the UK and Ireland, with a 65% increase in the number of these gardens registered by the Federation of Urban Farms and Community Gardens in 2011 compared to 2010 (FUFCG pers. comm. cited in Clavin, 2011). How many of these are used for food production is not clear but, as a comparator, Taylor and Lovell (2012) found that only 13% of community gardens in Chicago were being used for food production.

1.3. Synthesis and research questions

As the discussion above illustrates the literature on the benefits of food growing is mainly based on qualitative case studies and comparative quantitative measures of the prevalence of food growing, especially between countries, are rare (Wiskerke and Viljoen, 2012). Nevertheless, quantitative research in the USA does reveal certain social and demographic issues that may influence people's involvement in growing their own food and contribute to differences in the prevalence of food growing (The National Gardening Association, 2009). Similar issues have also emerged as potentially significant in the small number of quantitative studies that have been published in the EU (Alber et al., 2004; Anderson et al., 2009). Demographic and social factors such as age, health, education, income, and family structure/social networks have been found in some studies, but not all, to have an influence on the types of people who grow their own food (Alber et al., 2004; Anderson et al., 2009)..

The influence of these multiple factors may be complex and dependent on individual and context. For example, some of the literature found that poverty is linked to personal food growing whilst others show that it is wealthier people who get involved in food growing activities such as communal gardens. This suggests, for some people at least, that food growing is associated with leisure rather than subsistence activity (Kingsley et al., 2009; Burchardt, 2010), although there is no indication of how this affects the lives of these people more generally. Equally, research has explored the relationship between activities in allotments, food growing and health (van den Berg et al., 2010) although without specific reference to people's happiness. As noted above, food growing may results in costs and disadvantages for some individuals (Okvat and Zautra, 2011). The analysis in this paper, therefore, addresses these issues by exploring how food growing relates to measures in EQLS of participant happiness. Measures of happiness may reflect the combined effects of the positive and negative effects of food growing.

Geographical differences also need to be considered, as does change over time. At the very local scale access to a growing space such as a garden can influence involvement in food growing, whilst there is evidence of differences in food growing activity between rural and urban areas (Bingxin and Lingzhi, 2013; Pitt, 2013) and between countries (Wiskerke and Viljoen, 2012).

Research has tended to ignore the significance of context when trying to understand the prevalence of growing food for personal consumption. Whilst not an uncommon situation in health and social sciences research (Duncan et al., 1996; Chan and Austin, 2003) data do exist that can help uncover the relationships between people's characteristics and context, and whether they grow their own. The analysis seeks to understand the influence of context and geographical difference by comparing EU15 nations, taking account of urban and rural differences and including a case study of the UK. As the analysis was of change in the prevalence of food growing it was decided to provide a case study of one of the countries where change was most marked which were Belgium, Greece and the UK. Fig. 1 indicates that in all three countries the percent of households growing their own food grew by about 10%. The UK was selected from these three as change had started from the lowest base (4%) and there was a substantial literature on food growing available to the authors with which the analysis could be compared. The analysis of EQLS data was intended to be exploratory. Whilst it was rooted in the literature review, the understanding of food growing behaviour that the literature provides was insufficient to develop precise and testable hypotheses. The following three broad research questions were therefore asked:

1) What is the prevalence of 'growing your own food' across the EU15 nations and how has this changed over time?
2) How does the likelihood of growing your food vary by individual and household characteristics such as age, sex, wealth and health, and is the UK different to other EU countries in this regard?
3) Are people who grow their own food also happier than those who do not?

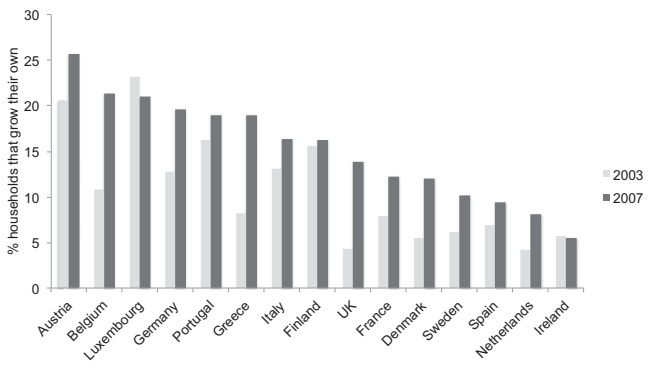

Fig. 1. Prevalence of growing your own food, as measured by the 2003 and 2007 European Quality of Life surveys (n = 14,547 for 2003, n = 17,431 for 2007).

2. Methods

2.1. Data

The European Quality of Life Surveys aim to capture both the objective circumstances of European citizens' lives and how they feel about those circumstances and their lives in general (Anderson et al., 2012). The surveys have a repeat cross-sectional design, and ran in 2003, 2007 and 2012. They cover a range of issues, such as employment, income, education, housing, family, health and work-life balance. EQLS also capture levels of happiness and life satisfaction (Anderson et al., 2012). The surveys are carried out using face-to-face interviews and administrated by an EU Agency, Eurofound, who follows up on at least 20% of interviews in each country in an attempt to guarantee (at least some) aspects of reliability and validity (Eurofound, 2010). Most importantly for this study, the 2003 and 2007 surveys identified those who grow their own food, though this question was dropped in 2012. The 2003 and 2007 EQLS asked: "In the past year, has your household helped meet its need for food by growing vegetables or fruits or keeping poultry or livestock?" Possible responses were: 1 No, not at all; 2 Yes, for up to one-tenth of the household's food needs; 3 Yes, for between one-tenth and a half of household's food need; 4 Yes, for half or more of the household's needs; 5 Don't know. 'Growing your own food' was defined as any response other than 'No, not at all'. Those who 'Don't know' were excluded from the analyses, as were those whose occupation was 'farmer'.

There were a significant number of changes to the survey sample, design and key covariates between the 2003 and 2007 surveys. Thus, whilst it was valid to use the two surveys to make a comparison of food growing prevalence at national level between 2003 and 2007, analysis of change over time in associations between individual and household characteristics, and growing food were not supported.

2.2. Covariates and analyses

The first stage of analysis was to compare the prevalence of growing food between 2003 and 2007, via simple tabulation. Prevalence was weighted using values provided by the survey team, in order to adjust for sample bias. Bivariate analyses were then used to explore associations between growing food and a set of covariates which were selected based on the literature review, within the constraints of what EQLS captured. These analyses were run separately for the UK and the whole EU15 sample, on the 2007 dataset. Table 1 shows the individual and household characteristics which were selected. Both Table 1, and all subsequent analyses, included only those respondents with valid responses on *all* the selected variables.

Associations were then formally explored via multivariate regression models. The model for the EU15 respondents was also multilevel. This choice reflected the study design used by EQLS, which sampled individuals within countries. Conventional regression models assume independence of observations, an assumption which might not hold in this sample (Leyland and Goldstein, 2001). It is likely that individuals residing within the same country are more similar to each other than to those residing in different countries. The multilevel model allowed for variance between subjects at both an individual level, and at a country level. We confirmed that a multilevel model was more suitable than a conventional form of regression which does not allow for sample clustering, using a likelihood ratio test (chibar 130.55, $p < 0.001$). The multilevel model was run in Stata v 11, using the gllamm module which is able to handle weights correcting for both within and between country sample biases. The sensitivity of results to the choice of model was checked by comparison with two alternative, but inferior, approaches to allowing for the clustering of individuals within countries, using Stata's cluster option to adjust standard errors and including country as an individual level variable (Williams, 2000). Substantive results did not differ and so only results from the full multilevel approach, considered superior, are presented (Goldstein, 2011; Williams, 2000). For the UK respondents, the model was a logistic regression weighted for within country sample bias. There was no need for a multilevel model on the UK data, since respondents from only one country were included in this model. Both sets of models included all the selected covariates shown in Table 1. Associations between growing food and reported happiness levels were then assessed. The EQLS asks "taking all things together, how happy would you say you are?" Respondents were offered a 10 point scale, where 1 denoted very unhappy and 10 denoted very happy. Within the EU15 sample, the happiness variable had a mean of 7.6, a standard deviation of 1.7 and a range from 1 to 10. For the UK sample, the happiness variable had a mean of 7.8, a standard deviation of 1.8 and a range from 1 to 10. We checked the sensitivity of our results to this choice of outcome variable by repeating the analysis with score on the WHO-5 wellbeing index (Bech, 2004). The WHO-5 scale is a well validated measure in which higher scores denote greater levels of mental wellbeing. Again, multilevel models for the EU15 sample and conventional regression for the UK sample were used, though these were linear rather than logistic. Models adjusted for the same set of covariates are shown in Table 1.

Table 1
Distribution of respondents within variables included in bivariate and multivariate analyses (n = 10,588 for EU15 and n = 786 for UK).

		EU15		UK	
		n	%	n	%
Food growing	Does not grow their own food	9021	85	676	86
	Grows their own food	1567	15	110	14
Age of respondent	Age 18–34	2323	22	195	25
	Age 35–64	5897	56	414	53
	Age 65 +	2368	22	177	23
Sex of respondent	Male	4803	45	350	45
	Female	5785	55	436	55
Household type	Single	2606	25	219	28
	Single parent	701	7	90	11
	Couple	3298	31	214	27
	Couple with child(ren)	3199	30	205	26
Financial situation	No financial strain	4324	41	320	41
	Some financial strain	5157	49	416	53
	Great financial strain	1107	10	50	6
Tenure	Own without mortgage	3622	34	225	29
	Own with mortgage	3427	32	283	36
	Tenant, paying rent to private landlord	1983	19	114	15
	Tenant, paying rent in social/voluntary	1354	13	151	19
	Accommodation is provided rent free	202	2	13	2
Household income	Lowest income quartile	2570	24	187	24
	Income quartile 2	2598	25	193	25
	Income quartile 3	2697	25	199	25
	Highest income quartile	2723	26	207	26
Education level of respondent	Up to ISCED 3[a]	6837	65	503	64
	ISCED 4 and above	3751	35	283	36
Respondent health	No illness	7493	71	542	69
	Yes, severely	675	6	42	5
	Yes, to some extent	1726	16	130	17
	Ill, but not hampered	694	7	72	9
Household situation	Rural (open countryside, village or small town)	5740	54	319	41
	Urban (medium/large town or city/suburb)	4848	46	467	59
Access to outside space	Lacks a place to sit outside	1173	11	77	10
	Doesn't lack a place to sit outside	9415	89	709	90
Spare time	Too much time for hobbies	335	3	21	3
	Just right amount of time for hobbies	5832	55	448	57
	Too little time for hobbies	4421	42	317	40

[a] ISCED = International Standard Classification of Education. Level 3 denotes education up to and including secondary school, level 4 and above denoted education level beyond secondary school.

3. Results

3.1. The prevalence of 'growing your own food' across the EU15 nations and change over time?

In 2003, 9.61% of respondents from the EU15 nations reported growing their own food. By 2007, this had risen to 15.5%. Belgium experienced the largest increase (a rise of 10.5 percentage points). The UK also saw a substantial increase of 9.5 percentage points. Increases were seen across almost all of the EU15 nations, with only Luxembourg and Ireland experiencing slight declines.

From Fig. 1 it is clear that there were no obvious regional or economic patterns to the prevalence of food growing, with countries from northern and southern Europe, and wealthier and poorer countries, observed at each end of the distribution. What is clear, however, is that growing patterns are changing in most EU15 countries, with only Luxembourg, Finland and Ireland experiencing little change in participation rates between 2003 and 2007. Fig. 1 also suggests that northern European nations, including Belgium, Germany, UK, Denmark, Sweden and the Netherlands, were more likely to have seen a marked increase. The geographical patterns that emerge from the analysis are complex and, for example, the neighbouring countries Finland and Sweden, have shown very different rates of change. Analysing all the variations between countries is beyond the scope of a single paper but the next section addresses spatial variation through an analysis of urban–rural variations and a discussion of the UK case study.

3.2. Social and geographical variations in the likelihood of growing your own food

Within the EU15 sample, there were significant bivariate associations between growing your own food and respondent age (older respondents more likely), household type (single and single parent households less likely), household tenure (renting households less likely), household situation (rural dwellers more likely) and the availability of an outdoor space (those without it, less likely) (all $p < 0.01$). There were no significant bivariate relationships between growing your own food and sex, income, financial strain, education and health.

Results within the UK sample were very similar, though the association with respondent age did not reach significance. Fig. 2 illustrates some of these associations.

Table 2 presents results from the regression models, showing association between the covariates and the likelihood of reporting growing your own food as odds ratios. Where an odds ratio and its confidence interval all exceed 1.0, possession of that characteristic significantly *increases* the likelihood of growing your own food. Where these values are all less than 1.0, the likelihood decreases. Odds ratios for categories of a variable are expressed relative to the 'reference' category, fixed at 1.0. So, for example, Table 2 shows that the odds of reporting growing your own food amongst those in the EU15 sample, aged 65+ are 1.81 (95% CI 1.40–2.34), relative to those aged 18–34. This means, after adjustment for all other characteristics in the model, those in this sample aged 65+ are about 1.81 times more likely to report growing their own food. The odds ratios suggest that amongst respondents from the EU15, those who were older, those who were in couple households, those under great financial strain, those who owned their own property, those with lower incomes, and those who lived in rural areas were *more* likely to report growing their own food (Table 2). Those in the highest two income quartiles and those in urban areas were less likely to grow their own food. The largest positive association was with being in a couple household (OR 2.14 (95% CI 1.86–2.47)). Some associations were different amongst UK participants however, with female respondents about 60% more likely to report that their household grows its own food than male respondents (there was no association with gender of respondent amongst the EU15), but no association with being aged 65+, financial strain, income or tenure, and those reporting illness which did not hamper their activities, more likely to also report growing food. Again, the largest positive association was with being in a couple household, but, in contrast to the EU15 sample, one which also contained children. Model fit for both the UK and EU15 samples was limited however, with a predictive power of just 11% for the UK model and 22% for the EU model.

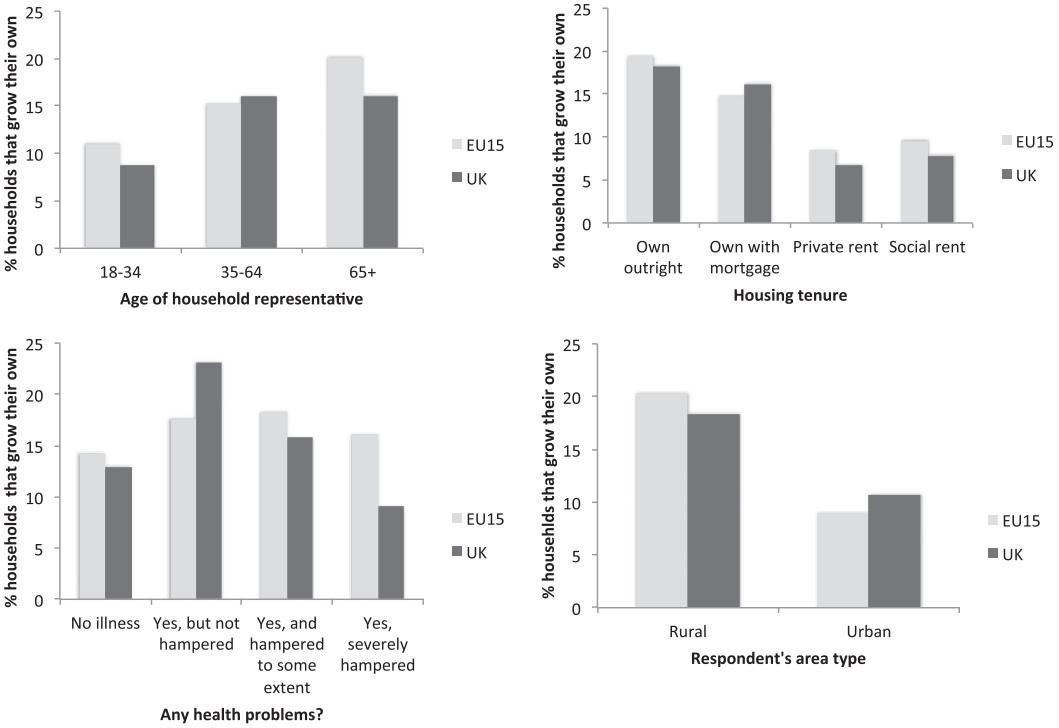

Fig. 2. Selected bivariate associations with growing your own food.

3.3. Growing your own food and happiness

Happiness scores were similar amongst the EU15 and the UK respondents: 7.63 (95% CI 7.59 to 7.66.) and 7.75 (95% CI 7.62 to 7.88) respectively. Results from the regression model showed that growing your own food was independently and positively associated with the scores on the happiness scale ($B = 0.15$, $p = 0.003$) amongst the EU15 respondents (Table 3). A conventional linear regression showed a similar relationship amongst the UK respondents ($B = 0.35$, $p = 0.02$). Overall, model fit was reasonable, suggesting that 38% of variation was explained in the UK model, and 43% in the EU15 model. Those who report growing their own food also, all else being equal, report being happier. Other statistically significant coefficients suggest, for example, that women are happier than men, couples are happier than single people and rural dwellers are happier than their urban counterparts. Financial strain, illness and an abundance of spare time for hobbies all negatively affect happiness levels. There was no substantive difference in results when using happiness as an outcome variable to those using the WHO-5 measure of wellbeing.

Finally, we compared the association between growing food and happiness with and without further adjustment for respondents' self-rated health to explore the possibility that the observed relationship between growing food and happiness might be mediated through physical and mental health. Health was captured in answer to the question "in general, would you say your health is very good, good, fair, bad or very bad". The association between growing your own food and happiness was moderately, but not significantly, weakened on adjustment for this self-rated health measure (data not shown).

4. Discussion

The results from the 2003 and 2007 waves of the EQLS indicate that participation in food growing for personal consumption has risen substantially over a short period of time, although not always from a strong initial base. Interestingly, the most substantial increases in participation have been in predominantly northern countries, including Belgium, Germany, UK, Denmark, Sweden and the Netherlands. The only southern country to witness a similar increase in participation was Greece. Whilst the highest rates of increase were nearly 10% over the 4 years, the average for the EU15 countries was 5.5%. This is comparable with the findings of the National Gardening Association (2009) in the USA, which found that approximately 7% of those surveyed wanted to start growing their own (recognising here that there is no record of how many actually did start).

Despite the rapid increases over the four years, participation rates remain relatively modest across the EU15 countries, with Austria having the highest participation rate, at a little over 25% of its population. This may be reflective of other quantitative data which indicates a more general desire amongst Austrians for organic food, whether purchased or grown by householders themselves (Willer and Kilcher, 2009). At the lower end, only a little over 5% of the Irish population grow any of their own food and the mean rates for the EU15 countries are around 15% of the population (UK participation is equivalent to this European average). In contrast, the equivalent rate for the USA is reportedly over 30% of the population (National Gardening Association, 2009), whilst new and candidate members of the EU (in 2007) also had participation rates in excess of the EU15 countries (Anderson et al., 2007). Since it should be recognised that 'growing your own' includes everyone who reported makes even a modest contribution to household food provision, the data suggest that growing your own food remains a relatively minor contribution to feeding the populace. Qualitative studies have found, however, that even a small 'harvest' brings personal satisfaction from having grown food and may thus contribute to a sense of happiness (Pitt, 2013; Tomkins, 2014).

Across the EU15 countries, the data suggest that food growing is largely associated with need. This is witnessed particularly in terms of lower income households and those under financial strain being more likely to grow their own than those who are not under these pressures. This is consistent with evidence from elsewhere, that the prevalence of growing your own for personal consumption is higher in lower income countries or where there are significant barriers to accessing fresh food (see Anderson et al., 2009, with respect to central and eastern Europe, and Henn and Henning, 2003, with respect to Cuba). Also whilst it is not possible to establish a causal connection between historical and current patterns of food growing it is worth noting that these findings resonate historically with the nineteenth century role of allotment gardening conventionally being constructed as part of household survival (Burchardt, 2010; Turner et al., 2011).

Previous studies (Kortright and Wakefield, 2011, for example) have indicated, however, that growing your own is also related to having the time and space to do so. There was less indication of this for the EU15, with time for hobbies not being significant. Kortright and Wakefield (2011) also found that skill levels were important in determining whether or not someone gardens. Whilst this was not addressed in the EQLS, the fact that older people are more likely than younger people to grow their own might suggest that issues such as experience and skills may be significant.

The results of the EQLS do suggest that the position in the UK may be at odds with the broader findings. In particular, there does not seem to be an association between income and involvement in growing your own. This suggests that future research may need to look beyond economic issues to understand the motives for food growing in the UK. Indeed, as Farley and Symmons Roberts argue, food growing not driven by economic necessity could be seen as a form of counter-cultural activity:

> The huge growth in interest and participation in public gardens and community orchards, together with the way that food ethics and a concern for sustainability and responsibly sourced product have entered the cultural mainstream in recent years, means that allotments have become popular again, even cool, their promise of self-sufficiency, thrift and health coinciding with a broadsheet emphasis on environmentalism … they offer an alternative to a life of getting and spending.
>
> [Farley and Symmons Roberts, 2011: p. 108]

Regardless of the motivations for growing their own, the EQLS suggests that respondents who grow their own are happier than those who do not. Whilst there is no indication or suggestion of causality here, it does suggest that the claims regularly made about benefits to wellbeing of gardening might be well-founded, at least to the extent that happiness, health and well-being are connected (Mougeot, 2005). These are thought to be related to the externalities associated with gardening, such as better physical and mental health, as well as positive feelings associated with the contribution that gardening can make to reducing people's carbon footprint. Our exploration of self-rated health as a mediator offers some support to this hypothesis, but could not offer robust confirmation.

The study had a number of strengths. The inclusion of a variety of personal, household and contextual covariates means that the potential for confounding is reduced and the various influences on propensity to grow your own were revealed. The use of multi-level models to account for clustering of individuals within countries was also important to minimise bias and model error. The large sample size and range of countries included helped secure validity for the study. However, the changes in EQLS study design which precluded modelling time as a factor in the models, and the repeat cross-sectional design as opposed to a panel design, are important limitations. The people surveyed in 2003 are not the same as those surveyed in 2007. A proper panel design would have enabled more sophisticated analyses of exactly which types of people in which settings were those who had started, increased or

Table 2
Odds ratios from regression models predicting growing your own food (n = 10,588 for EU15, n = 786 for UK).

	EU15			UK		
	OR[a]	p	95% CI	OR[a]	p	95% CI
Age 18–34	1.00					
Age 35–64	1.32	0.01	1.09 to 1.61	1.64	0.12	0.87 to 3.07
Age 65 +	1.81	0.00	1.4 to 2.34	1.82	0.20	0.72 to 4.6
Male	1.00					
Female	1.01	0.92	0.84 to 1.22	1.62	0.05	1.01 to 2.6
Single	1.00					
Single parent	1.45	0.02	1.06 to 1.99	1.94	0.20	0.71 to 5.29
Couple	2.14	0.00	1.86 to 2.47	2.21	0.02	1.12 to 4.36
Couple with child(ren)	2.12	0.00	1.58 to 2.85	2.96	0.00	1.42 to 6.17
Other	2.38	0.00	1.87 to 3.03	3.71	0.02	1.29 to 10.7
No financial strain	1.00					
Some financial strain	1.11	0.51	0.82 to 1.5	0.94	0.82	0.56 to 1.58
Great financial strain	1.42	0.02	1.07 to 1.88	0.79	0.75	0.19 to 3.38
Own without mortgage	1.00					
Own with mortgage	0.87	0.32	0.65 to 1.15	1.39	0.35	0.69 to 2.8
Tenant, paying rent to private landlord	0.51	0.00	0.4 to 0.63	0.76	0.62	0.25 to 2.27
Tenant, paying rent in social/voluntary	0.45	0.00	0.33 to 0.61	0.57	0.23	0.23 to 1.42
Accommodation is provided rent free	1.28	0.38	0.74 to 2.21	1.95	0.56	0.21 to 18.53
Lowest income quartile	1.00					
Income quartile 2	1.10	0.41	0.88 to 1.37	2.01	0.09	0.91 to 4.46
Income quartile 3	0.83	0.01	0.72 to 0.95	0.98	0.96	0.45 to 2.12
Highest income quartile	0.67	0.02	0.47 to 0.94	1.42	0.42	0.61 to 3.3
Up to ISCED 3	1.00					
ISCED 4 and above[b]	0.98	0.86	0.81 to 1.19	1.40	0.18	0.85 to 2.32
No illness	1.00					
Yes, severely	0.90	0.55	0.64 to 1.27	0.58	0.51	0.11 to 2.92
Yes, to some extent	1.10	0.28	0.93 to 1.3	1.24	0.53	0.64 to 2.41
Ill, but not hampered	0.99	0.97	0.55 to 1.77	2.80	0.01	1.3 to 6.03
Rural (open countryside, village or small town)	1.00					
Urban (medium/large town or city/suburb)	0.46	0.00	0.31 to 0.67	0.67	0.08	0.42 to 1.05
Lacks a place to sit outside	1.00					
Doesn't lack a place to sit outside	1.24	0.40	0.75 to 2.05	1.35	0.57	0.48 to 3.82
Too much time for hobbies	1.00					
Just right amount of time for hobbies	0.94	0.86	0.5 to 1.79	1.13	0.88	0.25 to 5.00
Too little time for hobbies	0.95	0.88	0.5 to 1.8	1.08	0.92	0.24 to 4.97
Constant	0.10	0.00		0.02	0.00	

[a] OR = odds ratio.
[b] ISCED = International Standard Classification of Education. Level 3 denotes education up to and including secondary school, level 4 and above denoted education level beyond secondary school.

indeed decreased their food growing. In turn, this meant that there could be no assessment of any extent to which growing your own food causes changes in people's happiness. Model fit for the analysis of growing your own food was relatively poor. Therefore although significant determinants of growing your own food are captured by our analysis other determinants – which may or may not be measured or measurable – are not. Finally, the complexities of the EQLS survey design meant that proper weighting at both levels of the multi-level model was difficult.

The analysis showed, however, that despite these limitations valuable new findings about people growing their own food can be obtained from the EQLS and no other data exists that allows the European comparisons presented in this paper to be made. It would be useful if the questions on food growing could be re-instated in further EQLS surveys after they were removed from the 2012 survey to see if the growth in personal food growing across Europe has continued in recent years. Indeed, such data would be even more valuable given the economic and policy changes that have taken place since the data were last collected in 2007. The recent period of economic austerity since 2008 may have continued the trend identified in this paper and stimulated further households to take part in personal food growing as a response to hardship (Clavin, 2011).

There have also been very marked changes in public policy to stimulate food growing, especially in cities, either by support for community food growing gardens and allotments (Tomkins, 2014) or through urban food strategies designed in countries across Europe to integrate sustainable food initiatives into urban planning (Viljoen, 2005; Wiskerke and Viljoen, 2012). Up-to-date data on households growing food may provide insights into the context in which these policies are being developed. Indeed, the findings of the period 2003–2007 presented in this paper have implications for contemporary policy designed to stimulate sustainable urban planning and pro-environmental behaviours through encouraging personal food growing and urban agriculture (Bohn and Viljoen, 2012). The data suggest that recent policies in Europe to stimulate urban agriculture, many of which started between 2000 and 2010 (Morgan, 2009; Tomkins, 2014), may actually have coincided with a growth in public participation in food growing rather than this social process being led by policy. Discussions over the best forms of sustainable urban food policy stress that communication initiatives to stimulate personal food growing will need to provide information, advice on skills and techniques, and educational materials to raise awareness of the health, food security and economic benefits of food growing (Mougeot, 2005; Hodgson et al., 2011). The findings in this paper suggest that the increase in happiness associated with food growing might also be stressed by awareness raising policy. Communication initiatives, however, will need to be varied depending on the target social group in order to address the different motives for growing food between middle and low income groups identified in this paper. In addition, given the negative effects of urban gentrification on the urban food growing spaces of low income residents found in the USA (Pudup, 2008), policy may also need to consider how access to spaces for food growing can be

Table 3
Coefficients from regression models predicting happiness (n = 10,588 for EU15, n = 786 for UK).

	EU15			UK		
	B[a]	p	95% CI	*B*	p	95% CI
Does not grow their own food						
Does grow their own food	0.15	<0.01	0.05 to 0.25	0.35	0.02	0.05 to 0.66
Age 18–34						
Age 35–64	−0.27	<0.01	−0.34 to −0.21	−0.26	0.14	−0.6 to 0.08
Age 65 +	−0.19	0.06	−0.4 to 0.01	0.40	0.09	−0.06 to 0.86
Male						
Female	0.10	0.02	0.02 to 0.18	0.24	0.06	−0.01 to 0.5
Single						
Single parent	0.13	0.01	0.03 to 0.24	0.37	0.15	−0.13 to 0.88
Couple	0.71	<0.01	0.61 to 0.82	0.54	<0.01	0.17 to 0.91
Couple with child(ren)	0.91	<0.01	0.67 to 1.15	0.67	<0.01	0.28 to 1.07
Other	0.61	<0.01	0.42 to 0.8	0.39	0.16	−0.15 to 0.94
No financial strain						
Some financial strain	−0.50	<0.01	−0.61 to −0.38	−0.51	<0.01	−0.79 to −0.23
Great financial strain	−1.40	<0.01	−1.92 to −0.87	−2.04	<0.01	−2.84 to −1.24
Own without mortgage						
Own with mortgage	−0.09	0.06	−0.18 to 0	0.04	0.84	−0.32 to 0.4
Tenant, paying rent to private landlord	−0.23	<0.01	−0.35 to −0.12	−0.36	0.12	−0.82 to 0.1
Tenant, paying rent in social/voluntary	−0.22	<0.01	−0.36 to −0.08	−0.38	0.09	−0.83 to 0.06
Accommodation is provided rent free	−0.05	0.80	−0.45 to 0.34	1.22	0.03	0.14 to 2.31
Lowest income quartile						
Income quartile 2	0.10	0.03	0.01 to 0.18	0.11	0.60	−0.3 to 0.52
Income quartile 3	0.09	0.05	0 to 0.18	0.05	0.83	−0.39 to 0.48
Highest income quartile	0.05	0.56	−0.12 to 0.23	0.01	0.96	−0.49 to 0.51
Up to ISCED 3[b]						
ISCED 4 and above	−0.03	0.40	−0.09 to 0.04	−0.18	0.21	−0.47 to 0.1
No illness						
Yes, severely	−0.95	<0.01	−1.2 to −0.7	−1.43	<0.01	−2.27 to −0.58
Yes, to some extent	−0.38	<0.01	−0.53 to −0.23	−0.46	0.01	−0.82 to −0.09
Ill, but not hampered	0.05	0.58	−0.13 to 0.24	−0.32	0.13	−0.74 to 0.1
Rural (open countryside, village or small town)						
Urban (medium/large town or city/suburb)	−0.05	0.32	−0.16 to 0.05	−0.33	0.01	−0.6 to −0.07
Lacks a place to sit outside						
Doesn't lack a place to sit outside	0.15	0.01	0.04 to 0.26	0.00	0.99	−0.5 to 0.49
Too much time for hobbies						
Just right amount of time for hobbies	0.09	0.50	−0.17 to 0.35	−0.54	0.04	−1.04 to −0.03
Too little time for hobbies	−0.11	0.51	−0.42 to 0.21	−0.90	<0.01	−1.43 to −0.37
Constant	7.58	0.00	7.29 to 7.87	8.74	0.00	7.82 to 9.67

[a] *B* = regression coefficient.
[b] ISCED = International Standard Classification of Education. Level 3 denotes education up to and including secondary school, level 4 and above denoted education level beyond secondary school.

maintained for those whose main motivation to grow their own is a response to economic hardship.

5. Conclusions

This paper has sought to address some of the many claims that have been made for the popularity of, and benefits associated with, growing food for personal consumption. Using the European Quality of Life Survey outputs for 2003 and 2007, the paper has shown that, for the 15 countries that comprised the European Union prior to its recent expansion, the popularity of growing your own has increased substantially, although unevenly. In some cases, the UK included, the proportion of households which grow at least some of their own food has more than doubled between 2003 and 2007, to reach approximately 15% of total households. In other cases, including Luxembourg, Finland and Ireland, the levels of activity have hardly changed.

In contrast to the many studies that have sought to position the contemporary western practice of 'growing your own' food as a leisure activity, therefore, this paper has shown that, for the majority of Europeans who participate, the practice remains at its core a response to economic hardship. Not only is this a pattern that reflects the historical development of vegetable gardening – whether at home or on an allotment – but it is also consistent with studies of poorer and less developed countries, where the correlation between growing and economic hardship is well established (Mougeot, 2005; Viljoen, 2005). As the paper has shown, this is not necessarily to paint a dour picture of 'forced' and pleasure-less activity, for the personal benefits of food growing are suggested by the clear association between growing your own and self-reported happiness. But neither is it to suggest that there is an established causal link between food growing and happiness. Rather, the paper shows that the claimed shift in the purpose of food growing, from necessity to leisure activity, may have been overplayed, certainly in the majority of the EU15 countries. In the UK, by contrast, the increase in food growing is less driven by economic necessity that elsewhere in the EU15, suggesting that the shift from necessity to leisure activity may be more advanced. This is an interesting finding that is certainly worthy of further research.

Acknowledgements

The authors gratefully acknowledge that the research for this paper was funded by the UK Arts and Humanities Research Council (grant numbers AH/E50292X/1 and AH/J006866/1).

References

Aertsens, J., Verbeke, W., Mondelaers, K., Van Huylenbroeck, G., 2009. Personal determinants of organic food consumption: a review. Br. Food J. 111 (10), 1140–1167.
Alber, J., Delhey, J., Keck, W., Nauenburg, R., 2004. Quality of Life in Europe: First European Quality of Life Survey 2003. European Foundation for the Improvement of Living and Working Conditions ([online] Available from: http://www.eurofound.europa.eu/publications/htmlfiles/ef04105.htm).

Altieri, M.A., Toledo, V.M., 2011. The agroecological revolution in Latin America: rescuing nature, ensuring food sovereignty and empowering peasants. J. Peasant Stud. 38 (3), 587–612.

Anderson, R., Mikulić, B., Vermeylen, G., Lyly-Yrjanainen, M., Zigante, V., 2009. Second European Quality of Life Survey: Overview. European Foundation for the Improvement of Living and Working Conditions ([online] Available from: http://www.eurofound.europa.eu/publications/htmlfiles/ef0902.htm, Last Accessed 5th February 2014).

Anderson, R., Dubois, H., Leoncikas, T., Sándor, E., 2012. Third European Quality of Life Survey — Quality of Life in Europe: Impacts of the Crisis. Publications Office of the European Union, Luxembourg.

Barthel, S., Folke, C., Colding, J., 2010. Social–ecological memory in urban gardens: retaining the capacity for management of ecosystem services. Glob. Environ. Chang. 20, 255–265.

Bech, P., 2004. Measuring the dimensions of psychological general well-being by the WHO-5. QoL Newslett. 32, 15–16.

Bingxin, Y., Lingzhi, Y., 2013. A typology of food security in developing countries. China Agr. Econ. Rev. 5 (1), 118–153.

Bohn, K., Viljoen, A., 2012. The CPUL City Toolkit: planning productive urban landscapes fro European cities. In: Wiskerkee, J.S.C., Viljoen, A. (Eds.), Sustainable Food Planning: Evolving Theory and Practice. Wageningen Academic Publishers, Wageningen, The Netherlands, pp. 479–494.

Buckingham, S., 2005. Women (re)construct the plot: the regen(d)eration of urban food growing. Area 37 (2), 171–179.

Burchardt, J., 2010. The FACHRS allotment project: summary and conclusions. In: Burchardt, J., Cooper, J. (Eds.), Breaking New Ground: Nineteenth Century Allotments From Local Sources. Family & Community Historical Research Society Ltd., Chesham, Bucks, U.K., pp. 9–54.

Byrne, J., 2013. Past results and future directions in urban community gardens research. [online] Available from:, http://www.academia.edu/2088440/Past_results_and_future_directions_in_urban_community_gardens_research (Last Accessed 5th February 2014).

Chan, B., Austin, P., 2003. Patient, physician, and community factors affecting referrals to specialists in Ontario, Canada: a population-based, multi-level modelling approach. Med. Care 41 (4), 500–511.

Church, A., Burgess, J., Ravenscroft, N., Bird, W., Blackstock, K., Brady, E., Crang, M., Fish, R., Gruffudd, P., Mourato, S., Pretty, J., Tolia-Kelly, D., Turner, K., Winter, M., 2011. Cultural services. UK National Ecosystem Assessment: Technical Report. UNEP-WCMC, Cambridge, U.K., pp. 633–691.

Clavin, A.A., 2011. Realising ecological sustainability in community gardens: a capability approach. Local Environ. 16, 945–962.

Corrigan, M.P., 2011. Growing what you eat: developing community gardens in Baltimore, Maryland. Appl. Geogr. 31 (4), 1232–1241.

Crouch, D., 2003. The Art of Allotments: Culture and Cultivation. Five Leaves, Nottingham, U.K.

Crouch, D., Ward, C., 1999. The Allotment: Its Landscape and Culture. Five Leaves, Nottingham, U.K.

Davies, M.A., 2009. The price and quantity of land by legal form of organization in the United States. Reg. Sci. Urban Econ. 39, 350–359.

Davies, Z.G., Fuller, R.A., Loram, A., Irvine, K.N., Sims, V., Gaston, K.J., 2009. A national scale inventory of resource provision for biodiversity within domestic gardens. Biol. Conserv. 142, 761–771.

Draper, C., Freedman, D., 2010. Review and analysis of the benefits, purposes, and motivations associated with community gardening in the United States. J. Community Pract. 18, 458–492.

Duchemin, E., Wegmuller, F., Legault, A.M., 2008. Urban agriculture: multidimensional tools for social development in poor neighborhoods. Field Actions Science Report ([online] Available from: http://factsreports.revues.org/index113.html, Last Accessed 5th February 2014).

Duncan, C., Jones, K., Moon, G., 1996. Health-related behaviour in context: a multilevel modelling approach. Soc. Sci. Med. 42 (6), 817–830.

Eurofound, 2010. European Quality of Life Surveys. European Foundation for the Improvement of Living and Working Conditions ([online] Available from: http://www.eurofound.europa.eu/areas/qualityoflife/eqls/, Last Accessed 5th February 2014).

Farley, P., Symmons Roberts, M., 2011. Edgelands. Journeys Into England's True Wilderness. Jonathan Cape, London, U.K.

Fieldhouse, J., 2003. The impact of an allotment group on mental health client's health, well-being and social networking. Br. J. Occup. Ther. 66, 286–296.

Freeman, C., Dickinson, K.J.M., Porter, S., van Heezik, Y., 2012. My garden is an expression of me: exploring householders' relationships with their gardens. J. Environ. Psychol. 32, 135–143.

Goldstein, H., 2011. Multilevel Statistical Models. Wiley, Chichester, UK.

Grewal, S.S., Grewal, P.S., 2012. Can cities become self-reliant in food? Cities 29, 1–11.

Guitart, D., Pickering, C., Byrne, J., 2012. Past results and future directions in urban community gardens research. Urban For. Urban Green. 11, 364–373.

Henn, P., Henning, J., 2003. Urban agriculture and sustainable urban systems: a benefits assessment of the garden movement in Havana, Cuba. Int. J. Environ. Sust. Dev. 1 (3), 202–209.

Hodgson, K., Caton Campbell, M., Bailkey, M., 2011. Urban agriculture: growing healthy sustainable places. PAS 5663American Planning Association, Planning Advisory Service, Chicago, USA.

Horticultural Trade Association, 2010. Market Update — All Things GYO Drive Garden Market. Horticultural Trade Association, Reading, U.K.

Jones, R., 2009. Allotment Demand Leads to 40-year Waiting Lists. The Guardian ([online], Available from: http://www.guardian.co.uk/money/2009/jun/02/allotments-shortage-waiting-lists, Last Accessed 5th February 2014).

Kingsley, J. "Yotti", Townsend, M., Henderson-Wilson, C., 2009. Cultivating health and wellbeing: members' perceptions of the health benefits of a Port Melbourne community garden. Leis. Stud. 28 (2), 207–219.

Kortright, R., Wakefield, S., 2011. Edible backyards: a qualitative study of household food growing and its contributions to food security. Agric. Hum. Values 28, 39–53.

Leyland, A.H., Goldstein, H., 2001. Multilevel Modelling of Health Statistics. Wiley, Chichester, UK.

Litt, J.S., Soobader, M.-J., Turbin, M.S., Hale, J.W., Buchenau, M., Marshall, J.A., 2011. The influence of social involvement, neighborhood aesthetics, and community garden participation on fruit and vegetable consumption. Am. J. Public Health 101 (8), 1466–1473.

McKay, G., 2011. Radical Gardening: Politics, Idealism & Rebellion in the Garden. Frances Lincoln Ltd., London, U.K.

Mees, C., Stone, E., 2012. Food, homes and gardens: public community gardens potential for contributing to a more sustainable city. In: Wiskerke, J.S.C., Viljoen, A. (Eds.), Sustainable Food Planning: Evolving Theory and Practice. Wageningen Academic Publishers, Wageningen, The Netherlands, pp. 431–452.

Middling, S., Bailey, J., Maslin-Prothero, S., Scharf, T., 2011. Gardening and the social engagement of older people. Working With Older People 15 (3) pp. 112–122.

Milligan, C., Gatrell, A., Bingley, A., 2004. 'Cultivating health': therapeutic landscapes and older people in northern England. Soc. Sci. Med. 58, 1781–1793.

MINTEL, 1997. Gardening Review. MINTEL Group, London, U.K.

MINTEL, 2005. Gardening Review. MINTEL Group, London, U.K.

Morgan, K., 2009. Feeding the city: the challenge of urban food planning. Int. Plan. Stud. 14 (4), 429–436.

Morgan, K.J., Marsden, T.K., Murdoch, J., 2006. Worlds of Food: Place, Power and Provenance in the Food Chain. Oxford University Press, Oxford, U.K.

Mougeot, J.A. (Ed.), 2005. Agropolis: The Social, Political and Environmental Dimensions of Urban Agriculture. Earthscan, London, UK.

Nabhan, G., 2002. Coming Home to Eat: The Pleasures and Politics of Local Foods. Norton, New York, U.S.A.

National Gardening Association, 2009. The impact of home and community gardening in America. ([online], Available from: http://www.gardenresearch.com/files/2009-Impact-of-Gardening-in-America-White-Paper.pdf Vermont, USA. Last Accessed 5th February 2014).

Okvat, H.A., Zautra, A.J., 2011. Community gardening: a parsimonious path to individual, community, and environmental resilience. Am. J. Community Psychol. 47, 374–387.

Pitt, H (2013) Growing together an ethnography of community gardening as place making. Unpublished PhD Thesis, University of Cardiff, UK.

Premat, A., 2009. State power, private plots and the greening of Havana's urban agriculture movement. City Soc. 21, 28–57.

Pudup, M.B., 2008. It takes a garden: cultivating citizen-subjects in organized garden projects. Geoforum 39, 1228–1240.

Ravenscroft, N., Moore, N., Welch, E., Church, A., 2012. Connecting communities through food: the theoretical foundations of community supported agriculture in the UK. Working Paper No. 115. CRESC Working Paper SeriesCentre for Research on Socio-Cultural Change, Open University and University of Manchester.

Ravenscroft, N., Moore, N., Welch, E., Hanney, R., 2013. Beyond agriculture: the counter-hegemony of community farming. Agric. Hum. Values 30, 629–639.

Ray, J., 2012. The Seed Underground: A Growing Revolution to Save Food. Chelsea Green Publishing, White River Junction, USA.

Sempick, J., Aldridge, J., Becker, S., 2004. Social and therapeutic horticulture: the state of practice in the UK. Centre for Child and Family Research, Evidence Issue 8. Loughborough University, U.K. ([online], Available from: https://dspace.lboro.ac.uk/dspace-jspui/bitstream/2134/2930/1/Evidence8.pdf,Last Accessed 5th February 2014).

Sempick, J., Aldridge, J., Becker, S., 2005. Health, well-being and social inclusion: therapeutic horticulture in the UK. Centre for Child and Family Research, Evidence Issue 11. Loughborough University, U.K. ([online], Available from: https://dspace.lboro.ac.uk/dspace-jspui/bitstream/2134/2922/1/Evidence11.pdf, Last Accessed 5th February 2014).

Shinew, K., Glover, T., Parry, D., 2004. Leisure spaces as potential sites for interracial interaction: community gardens in urban areas. J. Leis. Res. 36 (3), 336–355.

Statistics Netherlands, 2009. Over 200 hectares of allotment garden liquidations within a decade. [online] Available from:, http://www.cbs.nl/en-GB/menu/themas/dossiers/nederland-regionaal/publicaties/artikelen/archief/2009/2009-2889-wm.htm (Last Accessed 5th February 2014).

Taylor, J.R., Lovell, S.T., 2012. Mapping public and private spaces of urban agriculture in Chicago through the analysis of high-resolution aerial images in Google Earth. Landsc. Urban Plan. 108, 57–70.

The Economist, 2014. Location, location, location. [online] Available from:. http://www.economist.com/blogs/dailychart/2011/11/global-house-prices.

Tomkins, M. (2014) Making space for food: everyday community food gardening and its contribution to urban agriculture. Unpublished PhD Thesis, University of Brighton.

Turner, B., Henryks, J., Pearson, D., 2011. Community gardens: sustainability, health and inclusion in the city. Local Environ. 16 (6), 489–492.

van den Berg, A.E., van Winsum-Westra, M., de Vries, S., van Dillen, S.M.E., 2010. Allotment gardening and health: a comparative survey among allotment gardeners and their neighbors without an allotment. Environ. Heal. 9, 74.

Viljoen, A., 2005. Continuous Productive Urban Landscapes: Designing Urban Agriculture for Sustainable Cities. Architectural Press, Oxford, UK.

Vogel, G., 2008. Upending the traditional farm. Science 319, 752–753.

Wakefield, S., Yeudall, F., Taron, C., Reynolds, J., Skinner, A., 2007. Growing urban health: community gardening in South East Toronto. Health Promot. Int. 22, 92–101.

Wang, D., MacMillan, T., 2013. The benefits of gardening for older adults: a systematic review of the literature. Act. Adapt. Aging 37 (2), 153–181.

Willer, H., Kilcher, L., 2009. The world of organic agriculture. Statistics and Emerging TrendsFIBL-IFOAM Report.
Williams, R.L., 2000. A note on robust variance estimation for cluster-correlated data. Biometrics 56, 645–646.
Wiskerke, J.S.C., 2009. On places lost and places regained: reflections on the alternative food geography and sustainable regional development. Int. Plan. Stud. 14, 361–379.
Wiskerke, J.S.C., Viljoen, A., 2012. Sustainable urban food provisioning: challenges for scientists, policymakers, planners and designers. In: Wiskerke, J.S.C., Viljoen, A. (Eds.), Sustainable Food Planning: Evolving Theory and Practice. Wageningen Academic Publishers, Wageningen, The Netherlands, pp. 19–37.